

Appl. No. 10/537,350
Amendment dated: May 21, 2008
Reply to OA of: February 21, 2008

REMARKS

Applicants have amended the claims to more particularly define the invention taking into consideration the outstanding Official Action. Claim 62 has been amended by incorporating part of the features of claim 63, so limiting the present application only to the horizontal configuration of the reactor; and by incorporating the features, slightly reworded, claimed in claims 65 and 66, thus specifying that the fluidising inert gas flow is supplied to each fluidised stage of the reactor through a supply valve equipped with a corresponding heating device (*the basis for this amendment can be found, for instance, at pages 16, lines 7-10, and 18, lines 5-13, in connection with Figures 1A and 1B, of the application as originally filed.*)

Claim 98 has been amended by incorporating the feature that the casing of the reactor is horizontally arranged (*the basis for which can be found, for instance, at page 15, lines 23-25, in connection with Figures 1A and 1B, of the application as originally filed*) and by incorporating the feature that the fluidising inert gas flow, supplied to each fluidised stage of the reactor through a corresponding supply valve, is brought at the desired temperature thanks to the heating devices associated to said supply valves (*the basis for this amendment can be found, for instance, at pages 16, lines 7-10, and 18, lines 5-13, as well as in claims 4 and 5, in connection with Figures 1A and 1B, of the application as originally filed*).

Applicants have canceled claims 65-72 from the present application without prejudice or disclaimer. Applicants submit that all of the claims now present in the application are fully supported by the specification as originally filed and no new matter is introduced.

Applicants most respectfully submit that all of the claims now present in the application are in full compliance with 35 USC 112 and clearly patentable over the references of record.

The rejection of claims 62-67 under 35 USC 102(b) as being anticipated by Staffin et al. has been carefully considered but is most respectfully traversed in view of the amendments to the claims and the following comments.

Applicants wish to direct the Examiner's attention to MPEP § 2131 which states

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that to anticipate a claim, the reference must teach every element of the claim.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed.Cir. 1990).

In this regard, the horizontal reactor for solid phase continuous polymerisation of PET according to the claimed invention is new over Staffin, which does not disclose a reactor having a configuration intended for carrying out said solid phase continuous polymerisation.

As a matter of facts, Staffin refers to an olefin polymerisation process carried out in a horizontal reactor but, contrary to the process claimed in the subject patent application, occurring in the gaseous phase and implying the presence of a catalyst.

Furthermore, Staffin refers to an exothermic polymerisation reaction carried out in a reactor equipped with cooling means [see, column 6, lines 17-30, of Staffin]; on the contrary, the reactor according to the invention under examination as presently claimed is provided with heating devices for heating the fluidising gas flow.

Therefore, Staffin does not anticipate the invention under examination. Accordingly, it is most respectfully requested that this rejection be withdrawn.

The rejection of claims 62, 67-69, 71, 74, 76, 78-88, 91, 93-112, 115 and 120-122 under 35 U.S.C. 102(e) as being anticipated by Chen et al. has been carefully considered but is most respectfully traversed in view of the amendments to the claims and the following comments.

Firstly, Applicants would like to draw the Examiner's attention to the fact that the invention as presently claimed refers to a horizontal reactor while Chen teaches a vertical reactor.

The claimed invention refers to a reactor and a process for solid phase continuous polymerisation of polyethylene terephthalate (PET) intended:

- to achieve an increase of the intrinsic viscosity (I.V.) of low molecular weight PET pre-polymers, preferably in form of small size granules, particularly for use in PET bottles manufacturing;
- to attain high plant production capacities;
- to reduce the reactor size;
- to reduce the process time; and
- to reduce the costs relevant to the inert gas supply, regeneration and disposal.

Conventional continuous solid phase polymerisation processes are carried out in **vertical** reactors, such as that disclosed by Chen, whose main drawbacks are as follows:

- a considerable vertical size of the plant structure due to the presence of the pre-crystallisation unit, which is stacked onto the crystallisation unit, stacked in its turn onto the solid phase polymerisation reactor;
- a high polymer agglomeration tendency;
- a long residence time; and
- a great amount of inert gas used in the reactor.

As known, an increase of the polymer agglomeration tendency is caused:

- by increasing the granules residence time inside the reactor (either by increasing bed height or by decreasing granules velocity),
- by increasing the reactor temperature,
- by increasing the product volume, or "hold-up", in the reactor (either by increasing bed height or reactor diameter, or by decreasing granules velocity),

which are decisive factors in raising the final product I.V. and in reaching high plant production capacities; to prevent the agglomeration phenomenon, the reactor temperature should be lowered or, alternatively, either bed height or reactor diameter should be decreased or granules velocity should be increased: these modifications

Appl. No. 10/537,350
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clearly nullify the effect of the residence time increase or of the temperature increase or of the product volume increase on the final product I.V. or on the maximum production capacities obtainable with the conventional solid phase polymerisation processes.

Thanks to the provision of the compact and size-reduced **horizontal reactor with a plurality of fluidised stages according to the invention under examination**, the solid phase continuous polymerisation of a low molecular weight PET pre-polymers is carried out up to the required I.V. value in a moderate reaction time, by using a moderate gas amount and by reaching high production capacities; advantageously, the reactor and the process according to the invention under examination further allow to achieve a high degree of plug-flow and, consequently a high homogeneity and uniformity of the final product as well as to avoid unwanted agglomeration phenomena and other side effects even achieving higher molecular weight increases of the treated PET when compared with the ones achievable with the conventional processes of the known prior art.

The horizontal reactor for solid phase continuous polymerisation of PET according to the claimed invention is also new over Chen, which is deemed not to be a pertinent prior art document anticipating the invention as currently claimed. Accordingly, it is most respectfully requested that this rejection be withdrawn.

Applicants deem that a person skilled in the art would not have combined Staffin and Chen to achieve the invention as presently claimed, Staffin being referred to a completely different kind of polymerisation (gaseous olefin monomers, exothermic rather than endothermic reaction, use of a catalyst) and Chen providing a vertical reactor.

As a matter of fact and as anticipated hereinabove, Staffin discloses the use of a horizontal reactor for the polymerisation of monomers to polymers and copolymers, said monomers being primarily gaseous monomers and reacting in the presence of a catalyst [see *column 2, lines 53 to 64* and *column 3, lines 15 to 25*]; a person skilled in the art, therefore, would have not combined the teaching of this document with Chen to directly attain the solution herein discussed, which refers to a solid phase polymerisation not involving the presence of catalyst and wherein heating devices for

Appl. No. 10/537,350
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heating the fluidising gas flow are provided.

The rejection of claims 70, 75, 77, 89-90, 92, 113, 114, and 116-119 under 35 USC 103(a) as being unpatentable over Chen has been carefully considered but is most respectfully traversed in view of the amendments to the claims as discussed above with respect to the anticipation rejection over this reference. Accordingly, it is most respectfully requested that this rejection be withdrawn.

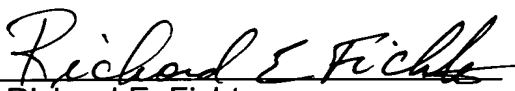
In conclusion, the claimed invention does not result in a simple combination of the available documents or a modification thereof which could have been carried out by one of ordinary skill in the art without exercising any inventive activity. On the contrary, the claimed invention represents a new and inventive arrangement over the existing prior art. Accordingly, the rejections should be withdrawn and the application allowed.

Applicant wishes to direct the Examiner's attention to copending application 10/523,650 entitled, Continuous Process For Solid Phase Polymerization of Polyesters and filed February 4, 2005.

In view of the above comments and further amendments to the claims, favorable reconsideration and allowance of all the claims now present in the application are most respectfully requested.

Respectfully submitted,

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